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(54) Timing in a data communications network

(57) A data communication network comprises a local clock (22) within a node (2) of the network which may be synchronized and syntonized by any node in the network. Each node contains a time packet detector (6) that detects and recognizes timing data packets and produces a recognition signal. Each node has a time server (10) that includes the local clock (22). The time server records the time of the recognition signal. The recorded time is used for correcting the local clocks of the various nodes (2) in the network. A transfer device such as a gateway, a bridge or a router may include a time server and a time packet detector to correct for the transit time of a time packet through such transfer device. The time packet detector (6) is connected at the point of final encoding for transmission or recovery of the clock and data.

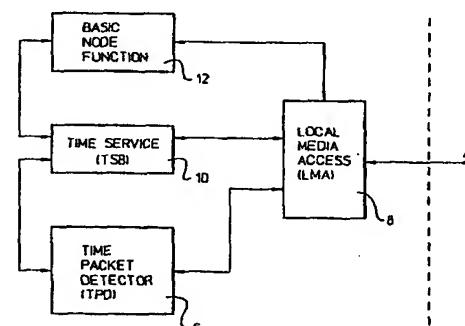


FIG. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 95 30 9322

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
Y	EP 0 247 026 A (AUSTRIA MIKROSYSTEME INT) 25 November 1987 * column 1, line 35 - line 48 * * column 4, line 17 - line 31 * * column 5, line 1 - line 8; figure 1 * ---	1-13	H04J3/06 G06F1/14
Y	US 4 893 318 A (POTASH RICHARD J ET AL) 9 January 1990 * column 5, line 18 - line 31 * * column 6, line 9 - line 16 * * column 8, line 55 - line 66 * * column 9, line 9 - column 11, line 66 * * figures 1,2,4,6,8 *	1-13	
A	SU S ET AL: "Time synchronization and ranging for multihop mobile radio networks" PROCEEDINGS OF IEEE INFOCOM '86. FIFTH ANNUAL CONFERENCE ON 'COMPUTERS AND COMMUNICATIONS INTEGRATION DESIGN, ANALYSIS, MANAGEMENT' (CAT. NO.86CH2284-8), MIAMI, FL, USA, 8-10 APRIL 1986, ISBN 0-8186-0694-0, 1986, NEW YORK, NY, USA, IEEE, USA, pages 636-640, XP002041766 * page 637, left-hand column, paragraph 3 - page 638, left-hand column, paragraph 2 * --- -/-	1-13	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			H04J G06F
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	25 September 1997	Pieper, T	
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone	T : theory or principle underlying the invention		
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P : intermediate document	& : member of the same patent family, corresponding document		



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EUROPEAN SEARCH REPORT

Application Number

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	COLE R ET AL: "AN EXPERIMENT IN CLOCK SYNCHRONISATION" COMPUTER JOURNAL, vol. 31, no. 6, 1 December 1988, pages 496-502, XP000068624 * page 496, right-hand column, last paragraph - page 497, left-hand column, paragraph 1 * * page 498, left-hand column, paragraph 4.1 - page 499, left-hand column * * figures 1-3 *	1-13	
A	HORDEN I: "VERSATILE MICROCONTROLLER FAMILY WORKS IN LOW-COST AND HIGH PERFORMANCE APPLICATIONS" WESCON TECHNICAL PAPERS, vol. 31, 1987, pages 1/4 1-05, XP000004638 * page 3, left-hand column, paragraph 2 - right-hand column, paragraph 1; figure 2 *	1,10	
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The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	25 September 1997	Pieper, T	
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone	T : theory or principle underlying the invention		
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A : technological background	D : document cited in the application		
O : non-written disclosure	L : document cited for other reasons		
P : intermediate document	& : member of the same patent family, corresponding document		



(12) UK Patent Application (19) GB (11) 2 364 203 (13) A

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(74) Agent and/or Address for Service Nokia IPR Department Nokia House, Summit Avenue, Southwood, FARNBOROUGH, Hampshire, GU14 0NG, United Kingdom	(58) Field of Search UK CL (Edition R) H4L LDLTA LDLTX LDLW , H4P PPF PSB PSEX PSX INT CL ⁷ G04G 7/00 7/02 , H04B 7/26 , H04J 3/06 , H04L 7/00 , H04N 5/04 Online Databases: WPI, EPODOC, JAPIO

(54) Abstract Title
Synchronisation of real time clocks of separate devices

(57) Devices such as multimedia devices communicating by radio according to the Bluetooth standard are synchronised to a common time reference such as a clock signal producing a repetition of beats or instances. Each device also has a real time clock . A transmitting device acting as a master transmits the value of its real time clock together with an indication of the instance at which the clock was read. A receiving device acting as a slave synchronises its real time clock to that of the master by calculating from the received value and instance, a master real time clock value at a later instance to which it can adjust. Alternatively the transmitter calculates the value of its real time clock at a future instance and transmits the value and future instance to the receiver for it to synchronise to.

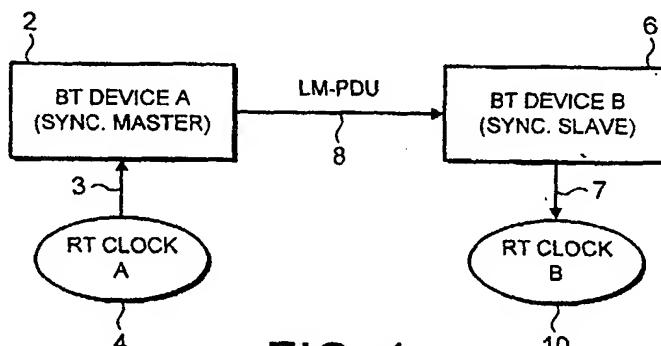


FIG. 1

GB 2 364 203 A

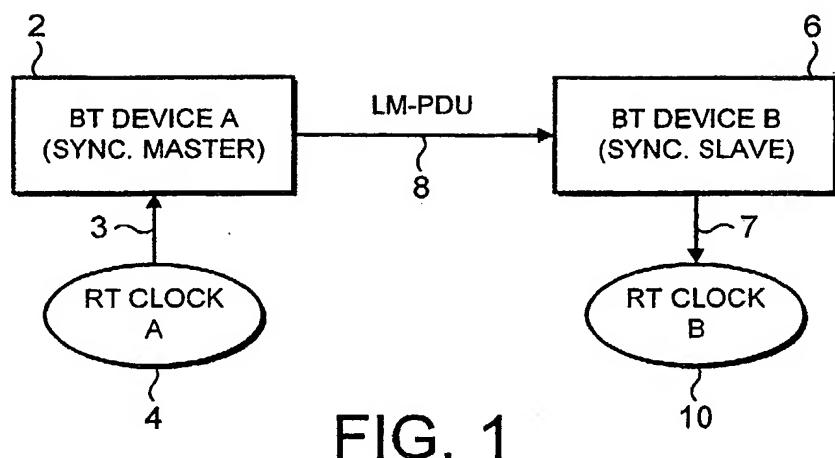
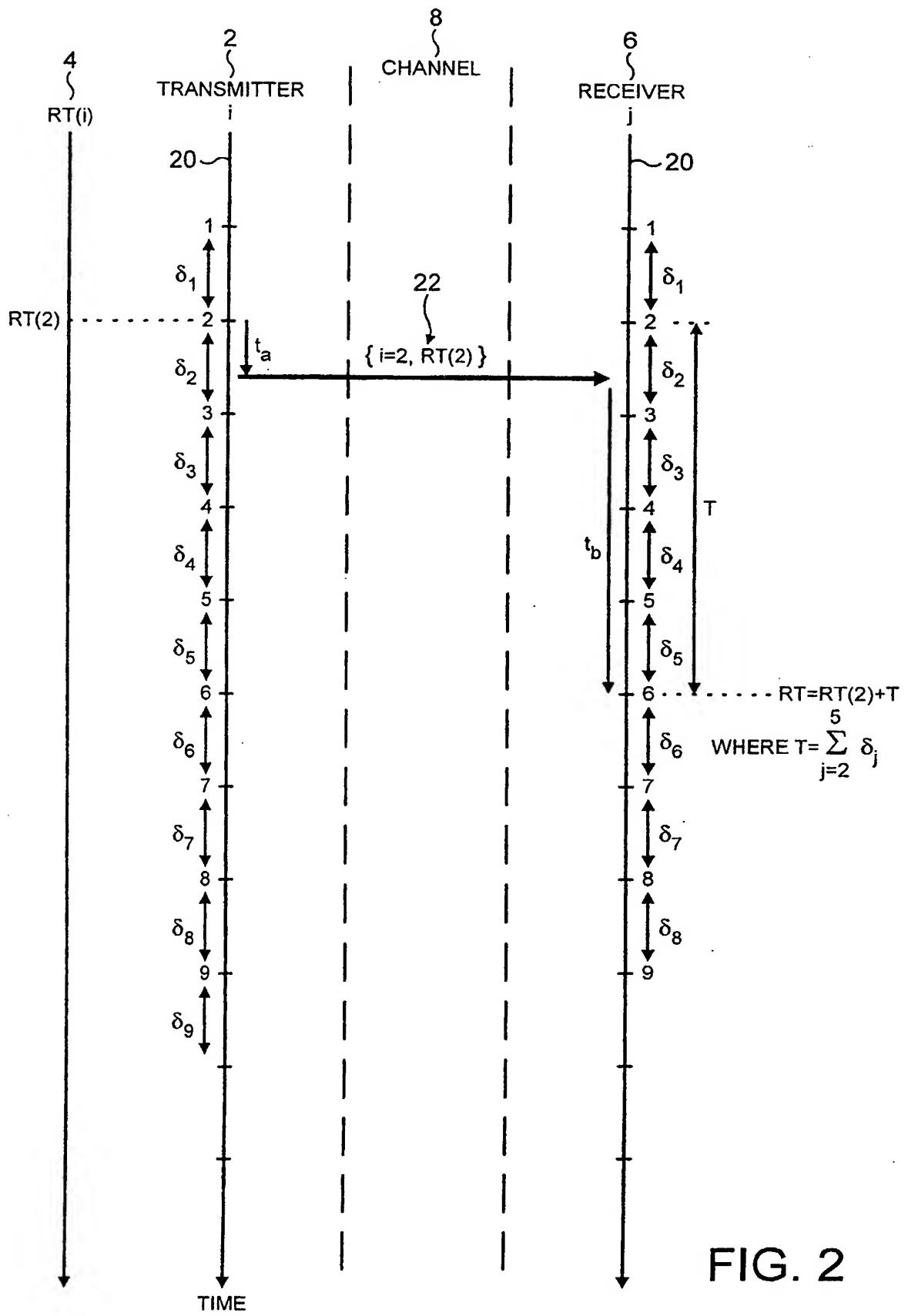


FIG. 1



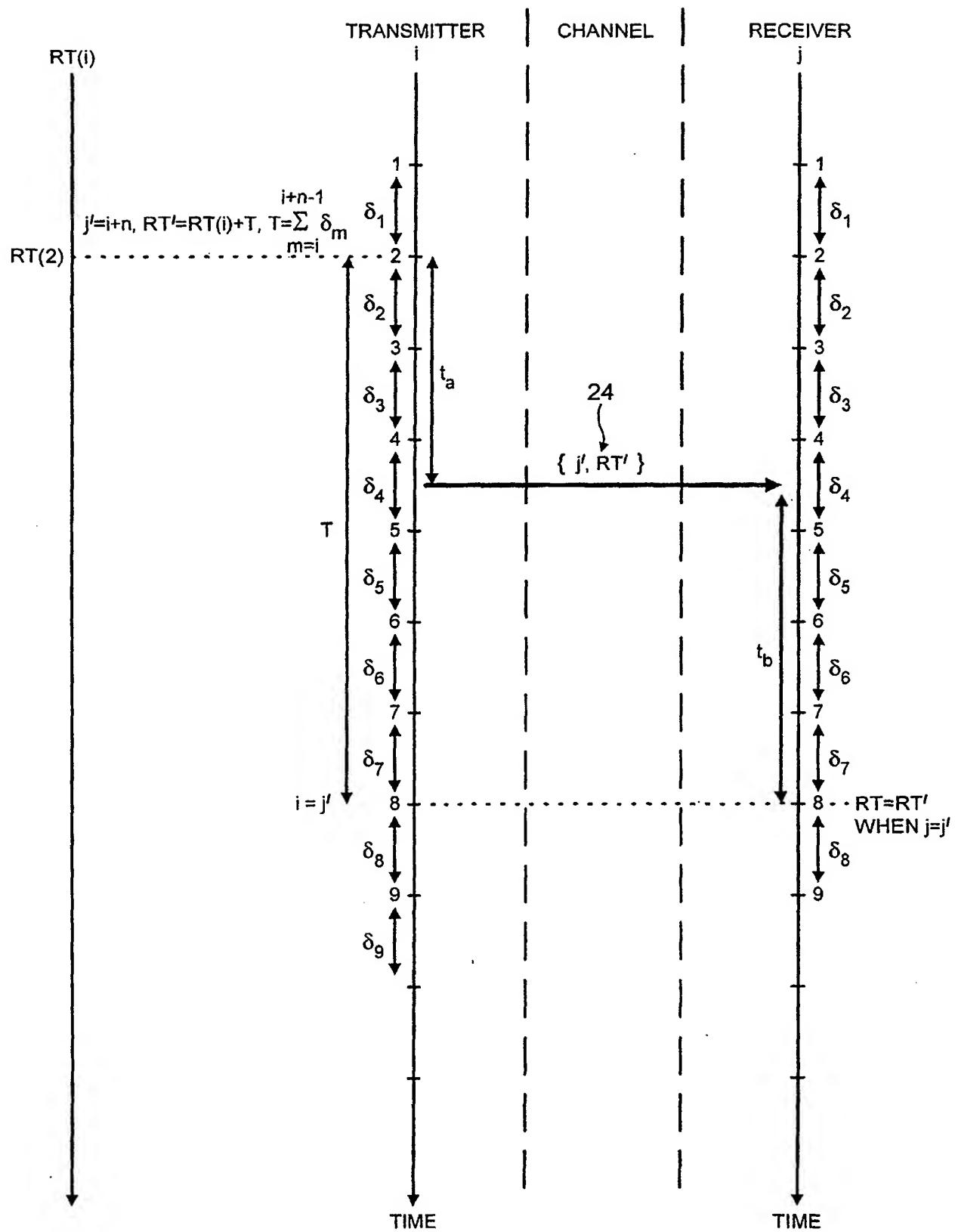
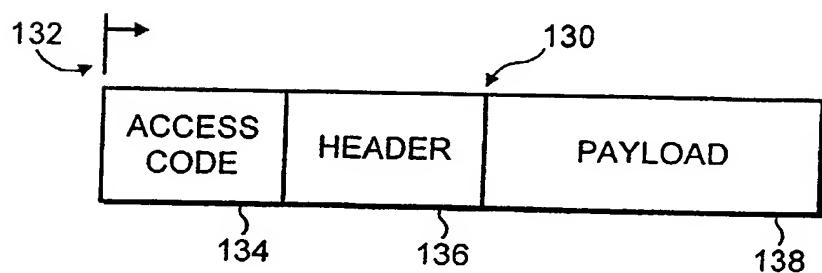
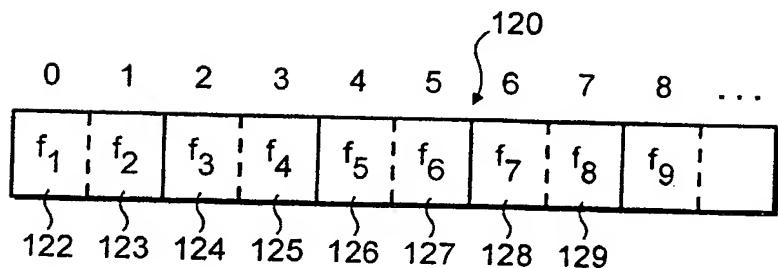
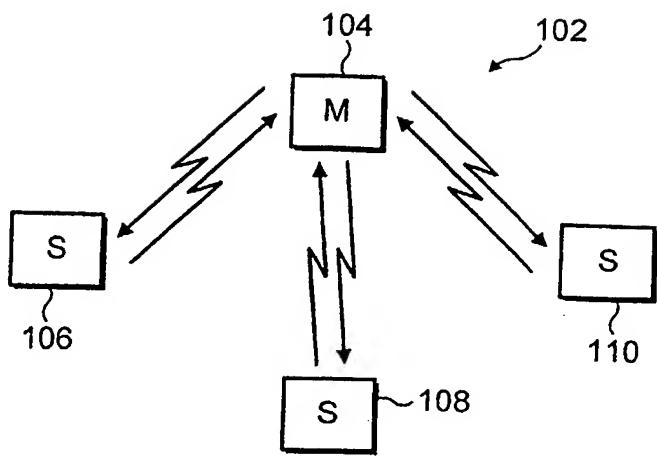


FIG. 3



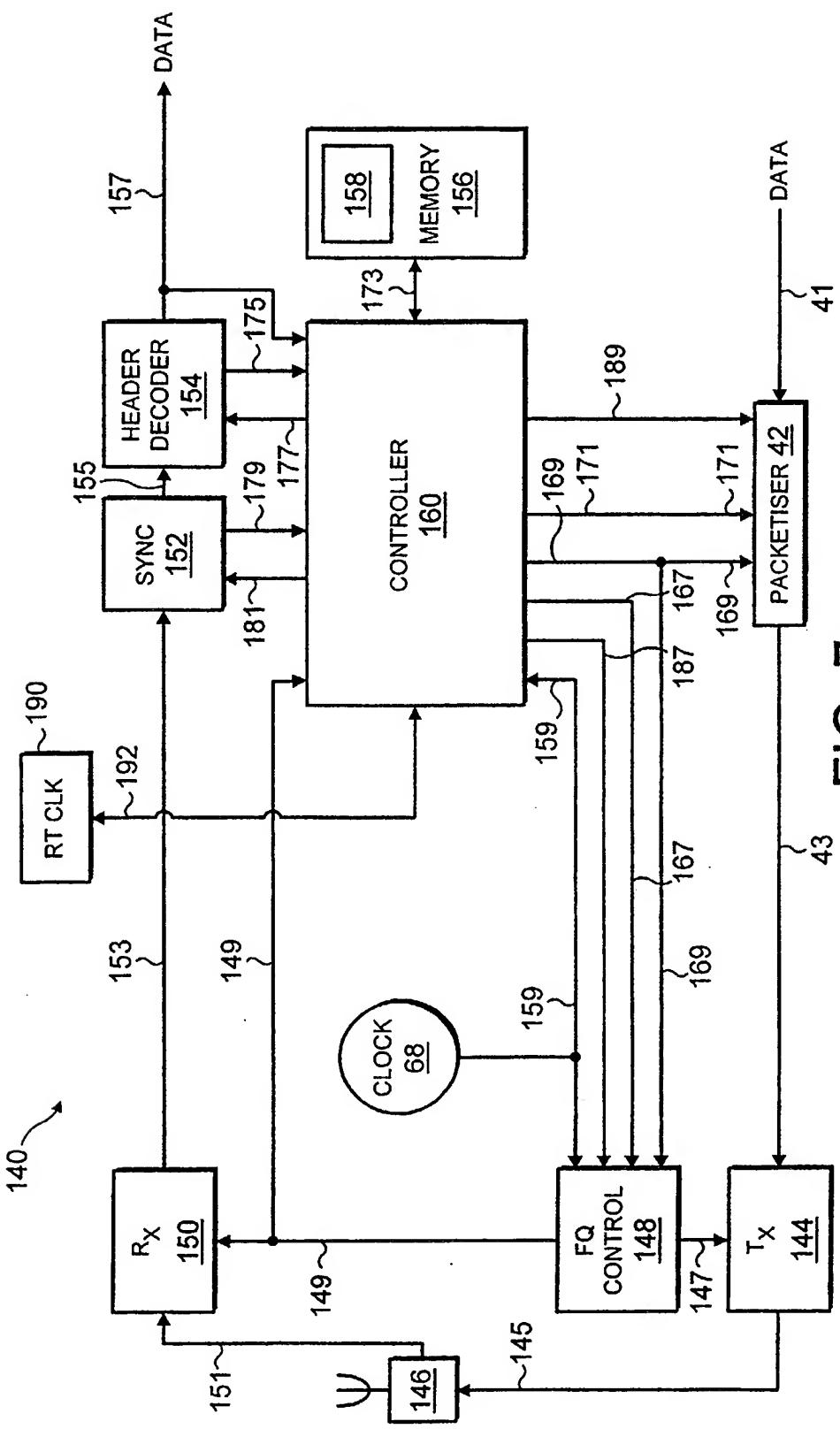


FIG. 7

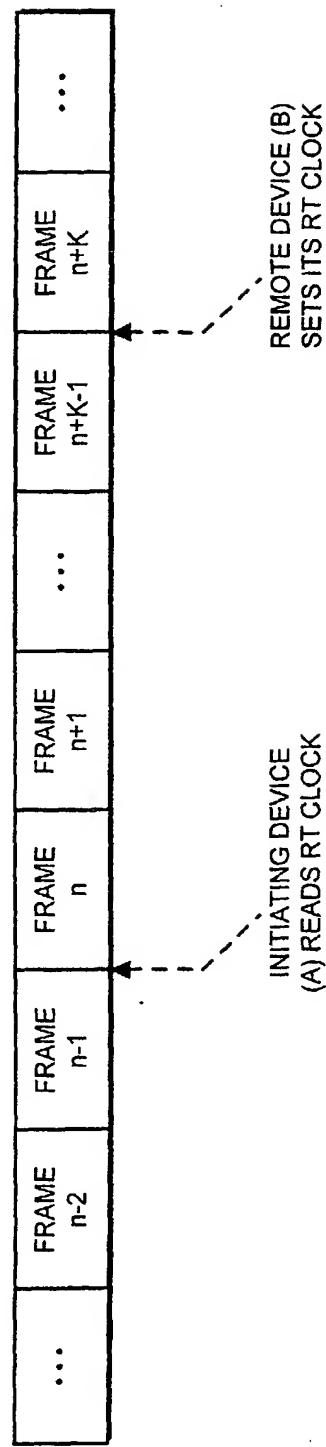


FIG. 8

Synchronisation

5 The present invention relates to the synchronisation of Real Time clocks of separate devices. It has particular application for devices communicating according to the Bluetooth Standard.

In an increasingly multimedia world, it is important to be able to control the
10 timing of multimedia output so that each of the outputs have the correct timing relative to other events and outputs. If the correct timing is achieved each output will be in real time and will be correctly synchronised with the other outputs.

15 If the outputs are distributed in space, however, it may be difficult to establish and maintain synchronicity between the real time clocks associated with each output. This problem is particularly acute when the latencies between the different outputs are unknown or variable.

20 This problem applies equally to multimedia inputs and maintaining the synchronism between them.

An exemplary scenario in which the problem comes to the fore is in a surround sound video application in which multiple audio outputs are
25 synchronised to the video output. During recording and playback the different media streams (audio and video) need to be adjusted with respect to a certain time reference.

It would be desirable to address the above mentioned problem of
30 synchronisation.